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Polypodium (with 73 species). Two species of the interesting and curious 'staghorn ferns' (*Platycerium grande* and *P. biforme*) occur on the islands.

SOME NOTEWORTHY BULLETINS.

PROFESSOR B. M. DUGGAR's paper on 'The Principles of Mushroom Growing and Mushroom Spawn Making' has been issued as Bulletin 85 of the Bureau of Plant Industry, of the United States Department of Agriculture. It covers sixty pages and includes seven half-tone plates. It will be useful to botanists and especially so to the growers of mushrooms.—Bulletin 84 of the Bureau of Plant Industry, entitled 'The Seeds of the Bluegrasses,' contains a paper by Edgar Brown on the germination, growing, handling and adulteration of bluegrass seeds, and another by F. H. Hillman, consisting of descriptions of the seeds of the commercial bluegrasses, and their impurities. Illustrations in the text add much to the value of the bulletin.—O. F. Cook and W. T. Swingle discuss the 'Evolution of Cellular Structures' in Bulletin 81 of the Bureau of Plant Industry. It is a discussion of the mode of evolution, and lays particular emphasis upon *symbasis*, that is, diversity of descent with normal interbreeding. They say 'species are sexual phenomena; they have come where they are only through symbasis; that is, as groups of interbreeding individuals, traveling together along the evolutionary pathway.'—From the same bureau, we have in Bulletin 90, part II., a short paper by G. G. Hedgcock on 'The Crown-Gall and Hairy-root Diseases of the Apple Tree,' in which the author separates the two, establishes the non-contagious nature of the first, says that there is no proof that the second is contagious, and shows by experiments that the first affects the growth of the tree little if any. The paper is in the nature of a report of progress and is very suggestive to plant pathologists and practical orchardists.—Bulletin 64 of the Forest Service, by Raphael Zon, deals with the characteristics, growth, distribution and uses of the loblolly pine (*Pinus taeda*) in eastern Texas. Especial attention is given to its use in the production of railway ties.—In

Bulletin 28 of the Bureau of Soils, B. E. Livingston, J. C. Britton and F. R. Reid give the results of their 'Studies on the Properties of an Unproductive Soil,' and reach the rather startling conclusion that the particular soil studied (at Takoma Park, Md.) 'contains a water-soluble, non-volatile substance or substances, probably organic in nature, which are toxic to wheat plants, causing a stunting of their growth.'—From the United States National Herbarium we have (Vol. VIII., pt. 4) the fourth of a series of 'Studies of Mexican and Central American Plants' by Dr. J. N. Rose, the result of a fourth journey to Mexico, made by the author. It contains many descriptions of new species, and critical notes upon old ones. It is illustrated by ten plates and six text figures.

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CURRENT NOTES ON METEOROLOGY.

KITE-FLYING OVER THE TROPICAL OCEANS.

REFERENCE has frequently been made in SCIENCE during the past two or three years to the project for exploring the atmosphere over the tropical oceans by means of kites, suggested by Mr. A. Lawrence Rotch, of Blue Hill Observatory, in 1901. It is pleasant to be able to chronicle, in these notes, the successful ending of a preliminary expedition undertaken during the past summer under the joint auspices of Mr. Rotch and of Mons. L. Teisserenc de Bort. Preliminary reports have appeared in the *Comptes Rendus*, October 9, 1905, 'Sur les Preuves de l'Existence du Contre-Alizé,' by Rotch and de Bort, and in *Nature*, November 16, 1905, 'The Exploration of the Atmosphere over the Tropical Oceans,' by the same authors. One of the chief objects of the expedition was to study the anti-trade winds from the southwest, which, according to a report by Dr. Hergesell, based on his observations in 1904, do not exist. The work last summer was done on board the *Otaria*, a steamer equipped with an electric kite-reel already used by de Bort for kite-flying at sea. Messrs. Clayton, of Blue Hill, and Maurice, assistant at the observatory at Trappes, carried out the exploration.

Paper pilot balloons, to show wind directions and not carrying instruments, were sent up and their height was obtained by simultaneous angular measurements at the end of a base-line on shore. Soundings of this kind were made at Madeira, Teneriffe and the Cape Verde Islands in particular, and also over the open ocean. Observations were also made on the peaks of Teneriffe and Togo, and included the drift of clouds above these peaks. Tabulations of these observations, and a chart showing the tracks of three balloons, make it evident that the winds blowing equatorward vary in direction between northeast and northwest. The latter are usually above the northeast stratum, the thickness of this layer of the trades near Teneriffe being about 3,000 or 5,000 meters. Above this there are southeast, south and southwest currents—the anti-trades—of great thickness, probably, but of small density. The east wind near the thermal equator extends very high, as had previously been inferred from the carriage of volcanic dust and the movements of lofty clouds. The southeast wind was observed by a balloon at the Cape Verde Islands up as far as 6.8 miles.

The results obtained during the past summer, therefore, confirm the accepted theory of trades and anti-trades, and are not in accord with the view advanced by Dr. Hergesell. North of Madeira and towards the Azores the upper winds, as already shown by cloud observations, are prevailingly from west and northwest, this region being usually north of the oceanic high pressure area and outside the trade wind zone. The anti-trades, with their southerly component, are generally southwest in the latitude of the Canary Islands and southeast near the Cape Verde Islands, corresponding to the effects of the earth's rotation. Upper cloud observations at Havana and in the Antilles further prove the existence of these winds.

AN INSTRUMENT FOR DETERMINING TRUE WIND DIRECTIONS AND VELOCITIES AT SEA.

IN the 'Report of the Imperial Academy of Sciences of St. Petersburg' for August, 1905, Mr. Rotch describes an instrument of his own invention which is designed to give

the true wind direction and velocity on a moving vessel at sea, an observation which has always been difficult and troublesome. The theory of this instrument is based on the triangle of forces. It consists of two movable discs, graduated into 360° each, and three rulers, hinged so that they may be adjusted to different angles. One of these rulers indicates the direction in which the vessel moves; a second shows the apparent, and the third the true wind direction. To set the instrument the direction of movement and the speed of the vessel; the apparent wind direction, shown by the smoke from the funnel, and the true wind direction shown by the waves, are needed. When the rulers are set to accord with these conditions, the true wind direction, in degrees, and the true wind velocity, in miles an hour, are shown by means of the discs above referred to.

Casella, of London, is the maker of the instrument, the price of which is approximately £3.

BRITISH RAINFALL, 1904.

THE forty-fourth annual volume on 'British Rainfall,' compiled by Dr. H. R. Mill, includes the records of 3,982 rain gauges. In his preface the compiler regrets that he can not visit more of the stations, and notes that the chief difficulty is the inadequate train service in the rural districts. The effect of the automobile's advent is noted in the statement that 'a few years ago the bicycle supplied a quick and easy means of overcoming the difficulty, but now, except for the fact that it is not prohibited by law, cycling on the high roads of England scarcely differs in point of danger from walking on the railways.' The volume contains an appreciative mention of the valuable work done at Ben Nevis Observatory since 1883, and now unfortunately given up, and the frontispiece shows the summit of the mountain in winter. There are other papers on subjects of more local British interest, but we call attention with special satisfaction to the charts showing the tracks of cyclones which produced exceptionally heavy rainfalls during the year 1904, the same charts showing also the distribution of the

rainfall. This is an emphasis on the cyclonic unit which we have long hoped to see.

R. DEC. WARD.

SOME STATE CENSUS FIGURES FOR 1905.

THE state censuses for 1905 are showing some instructive returns. Iowa, for instance, shows a loss of 15,000 persons since 1900. The cities of 5,000 population and over gained 77,000 people in all; the towns under 5,000 and the rural districts together report a loss of 92,000. In Minnesota, where the gain during the decade, 1890 to 1899, inclusive, was 33.7 per cent., there has apparently been a slowing up. The decennial rate was 3.37 per cent. a year; but for the past five years, 1900 to 1905, there was a gain of only 13 per cent., or 2.6 per cent. a year. As the basis broadens the rate of accretion necessarily becomes slower, while in Iowa the rate indicates even retrogression. The indications are that, either from urban migration or from other causes, or from all combined, the farming population even in the most prosperous portions of the west has practically ceased to grow.

One reason for this, if the view of arrested growth be accepted, is to be found in the rapidly rising price of farming land. For the past several years or more the trend of prices of land has gone upward with the prices of farm produce. Iowa, being a dairying and stock-growing state, has come to put such values upon her farm lands as to dislodge the old style of farming for a family home, in favor of the capitalistic farmer—the farmer who puts surplus income back into land, into better methods of cultivation, better stock and better facilities. The old-style farmer moves off to Canada for frontier lands, or to the southwest or northwest, where land is cheaper, after having reaped the reward of waiting, in the form of the unearned increment.

Kansas took her fifth decennial census on March 1, 1905, and found the insignificant increase of 8,658 persons in one year, the total population being 1,543,868. This gives an average of 14,703 people for each of the 105 counties. Of these counties 58 report an increase, and 47 a decrease, compared with

March 1, 1904. The highest increase is 2,987 persons out of a total of 48,058, or 6.6 per cent. gain in one year. The largest decline is one of 2,087 persons, leaving a population of 24,907, or 9.1 per cent. less than a year earlier. These are marked changes to occur in so small a population in the course of twelve months from ordinary causes in times of prosperity in city and country alike.

Turning from country to city, we see that in Kansas towns the same shifting is going on. One might think that towns have been the gainers of country losses; but this is not always the case. The changes are due to a wider range of influences than urban attraction. Of 119 cities of a thousand inhabitants and over, 61 gained in the last year and 58 lost in numbers. Only four gained over one thousand each, and five of the cities lost each a thousand or over; but none so much as two thousand. While these are small numbers, they indicate the presence of some active influences which are responsible for a great deal of readjustment. Kansas is eminently the commonwealth of comparatively small towns. How emphatically this is the case is apparent from the following table of towns of 1,000 people and over, which may or may not suggest some explanation of the gain and loss account within its borders:

No. of Towns.	Range of Population.
4	have each from 20,924 to 67,613 inhabitants.
8	have each from 11,190 to 18,257 inhabitants.
12	have each from 5,188 to 9,899 inhabitants.
40	have each from 2,013 to 4,427 inhabitants.
55	have each from 1,009 to 1,998 inhabitants.

Any attempt to trace these evidences of arrest in increase, or of decrease, to unfavorable agricultural conditions must fail; because the same tendency appears in manufacturing states. For instance, Massachusetts, which is more than half cities or towns of over 5,000, has a disappointing return in its census for 1905. Taking into account the increase in the previous decade, a growth in population of 375,000 was expected and predicted. The actual increase is 193,612, barely half the expected gain.